

THE
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THE RESEARCH AND DEVELOPMENT
BUDGET OF THE BUREAU OF
AERONAUTICS

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PREFACE

The objective of this paper is to analyze the research and development budget of the Bureau of Aeronautics, Navy Department. The analysis consists of a review of the guidelines employed, a step by step presentation of the budget formulation process, and a discussion of some of the problems pertinent to budgeting for research and development.

The highly classified nature of much of the material pertaining to research and development has made it necessary to omit references to specific projects, the dollar amounts involved in certain programs, and the details of some classified directives.

Grateful acknowledgment is made to the many personnel of the Navy Department who provided much of the information on budget preparation which is not available from published directives.

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CHAPTER I

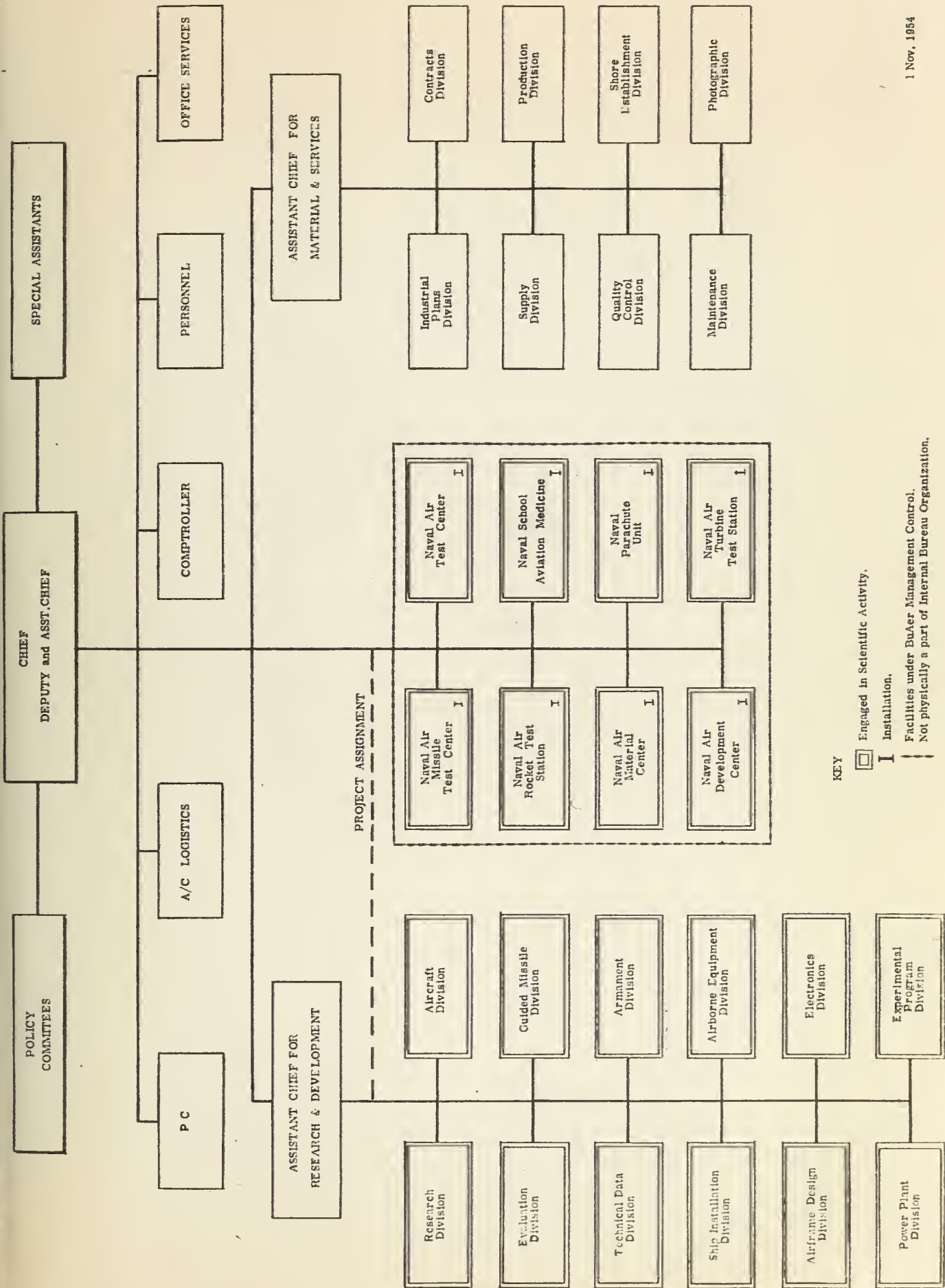
GUIDELINES FOR THE FORMULATION OF THE RESEARCH AND DEVELOPMENT BUDGET

In the Bureau of Aeronautics responsibility for research and development is vested in an Assistant Chief for Research and Development who "formulates (through assistants) and prosecutes (through direction of the research and development divisions) programs of research, design, development, testing and evaluation of aircraft, guided missiles and target drones, and ship, airborne and associated aeronautical equipment."¹ The 12 research and development divisions, comprised of some 600 civilian and 240 military personnel, expend approximately 150 million dollars each year on a program which involves 2,200 projects and 500 aircraft. A recent review revealed that 61 percent of these funds went to industry (represented by 500 contractors), 33 percent to field activities of the Bureau of Aeronautics, and the remaining 6 percent to other Navy or Department of Defense activities.² The position of the research and development divisions in the Bureau of Aeronautics is shown in Figure 1.

The research and Development budget of the Bureau of

¹The Bureau of Aeronautics Organization Manual

²Briggs, Chester A. Capt. USN
"Aeronautical Research and Development" a presentation to the Naval Post Graduate School, October 1954



KEY

Engaged in Scientific Activity.

I Installation.

Facilities under BuAer Management Control.
Not physically a part of Internal Bureau Organization.

Figure 1

Aeronautics is formulated from guidelines received from three sources. Detailed operational requirements with appropriate priority classification are received from the Chief of Naval Operations. These operational requirements are the basis for the research and development projects and programs of the Bureau of Aeronautics. Additional technical guidelines, instructions concerning the format and dates for submitting the research and development program for technical review, and the dollar ceiling under which the Bureau of Aeronautics research and development program is to be submitted are received from the Chief of Naval Research. Instructions for the format and dates for submission of the administrative breakdown and narrative justification of the research and development budget are received from the Office of the Comptroller, Department of the Navy.

As the above remarks would indicate the research and development budget follows a dual path. It receives a thorough technical review, including an examination from a requirements and priorities viewpoint, along one channel and an analysis from a fiscal viewpoint along the other channel. Figure 2 is a representation of the development of the Navy budget but it does not clearly illustrate this dual nature of the review of the research and development budget. In order to clarify the procedure, a chronological, step by step presentation of the formulation to date of the research and development budget for the fiscal year 1956 will be set forth.

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Figure 2

CHAPTER II

THE STEPS IN THE BUDGET FORMULATION PROCESS

On June 11, 1954 the Chief of Naval Research advised the Chief of the Bureau of Aeronautics that the Assistant Secretary of Defense (Research and Development) had requested that the research and development program be submitted by September 1, 1954 and that in order to meet this schedule the program should be submitted to the Office of Naval Research by July 16, 1954. He also specified the dollar limitation on the research and development program estimates for fiscal year 1956 which had been established by the Assistant Secretary of the Navy for Air. In addition he forwarded the following guidelines as enclosures:

- 1) "Assistant Secretary of Defense (Research and development) Planning Assumptions and Guidelines for Fiscal Year 1956" (Confidential)
- 2) "Navy Research and Development Review Board Program Guidance Fiscal Year 1956" (Secret)
- 3) "Format for submission of Fiscal Year 1956 Research and Development Project Listing"³

On June 24, 1954 the Chief of Naval Research forwarded to the Chief of the Bureau of Aeronautics additional instructions for the preparation of the initial fiscal year 1956 budget submission

³Chief of Naval Research Secret (Confidential less enclosures) letter of June 11, 1954

for the Appropriation "Research and Development Navy."⁴

On June 15, 1954 the Assistant Chief for Research and Development requested his division directors to establish research and development program estimates for the fiscal year 1956. These estimates were to be submitted to the Assistant Chief by July 2, 1954, allowing the period from July 7 to July 13 for review, and the period from July 14 to July 16 for final preparation and submission to the Chief of Naval Research. This directive also specified a breakdown among the divisions of the dollar limitation on research and development program estimates which had been forwarded by the Chief of Naval Research.⁵ This breakdown of the dollar ceiling on program estimates was made on the basis of the experience of previous years plus a knowledge of the major programs being implemented by the divisions, as well as the latest shifts in emphasis in the guidance issued by the Chief of Naval Operations.

The Experimental Program Division of the Research and Development Group is responsible, among other things, for the coordination of the preparation of the research and development program estimates. On June 16, 1954 the Director of the Experimental Program Division advised the Division Directors of the Naval Research and Development Guidelines for the fiscal year 1956. He also advised that specific recommendations of the Navy Research and Development Review Board on operational requirements

⁴Chief of Naval Research Confidential letter of June 24, 1954

⁵Assistant Chief for Research and Development, Bureau of Aeronautics Confidential Memorandum of June 15, 1954

would be forwarded to the Division Directors to guide them in preparation of their program estimates.⁶

On this basis the Division Directors prepared proposed programs, listing the various projects in their divisions and indicating the dollar amount planned for each project on the basis of the tentative dollar allocation made by the Assistant Chief for Research and Development. In addition an estimate of the amount that would be spent on each project was made on the basis of a 10 percent increase in the tentative dollar allocation, a 10 percent decrease in the tentative dollar allocation and finally on the basis that sufficient funds would be available to fully meet the operational requirements. Each division had to be prepared to provide detailed technical information and justification for each project listed. By virtue of the continuous liaison between personnel of the Research and Development Divisions and personnel in the office of the Chief of Naval Operations these breakdowns of projects reflected the latest developments and modifications in thinking along program planning lines.

By July 2, 1954 the various Division Directors had turned in their research and development program estimates which were then reviewed by the Assistant Chief for Research and Development. At this time the Division Directors presented their arguments for changes in the amounts allocated to their divisions. These arguments were generally based on the fact that important programs could not be adequately financed within the dollar limitation established for their division.

⁶Director Experimental Program Division, Bureau of Aeronautics Confidential Memorandum of June 16, 1954

When the final decision on the allocation of funds for program estimates was made by the Assistant Chief for Research and Development the Experimental Program Division assembled the program estimates into two basic documents. The first of these was a grouping of the program estimates by operational requirements such as Air Defense, Anti Submarine Warfare, Combat Air Operations, etc. The second document was a budget breakdown listing the individual program estimates by administrative divisions. Each of these documents was classified secret because of the project detail involved. The operational requirements breakdown of the research and development projects, with the planned fiscal year 1955 expenditures and the proposed fiscal year 1956 expenditures, was submitted to the Chief of Naval Research on July 16, 1954.⁷ On the basis of revised program guidance, received by the Bureau of Aeronautics from the Navy Research and Development Review Board, a revised program (but with the same total dollar figure) was submitted to the Chief of Naval Research on August 17, 1954.⁸

The Chief of Naval Research consolidated the research and development program estimates of all the Navy bureaus and submitted them to the Chief of Naval Operations. There the Naval Research and Development Review Board conducted hearings and made recommendations from a requirements and priorities viewpoint. Since The Bureau of Aeronautics program had been so closely aligned

⁷Chief of the Bureau of Aeronautics Secret letter of July 16, 1954

⁸Chief of the Bureau of Aeronautics Secret letter of August 17, 1954

with operational requirements, as has been previously indicated, these hearings resulted in only minor reallocations of funds with respect to a few projects. No change was effected in the total dollar program of the Bureau of Aeronautics. These program estimates were later reviewed by the Research and Development Committee, the Assistant Secretary of the Navy for Air and by the Assistant Secretary of Defense for Research and Development.

In the meanwhile the budget breakdown had been forwarded to the Comptroller Division of the Bureau of Aeronautics. Personnel of this division, in conjunction with the Experimental Program Division, prepared narrative justification and back-up tables in accordance with current instructions.⁹ These back-up tables contained all the administrative details such as amounts budgeted for Navy field activities, amounts budgeted by object classification, personnel information etc. Any necessary revisions to the language sheets are originated by the Navy Comptroller after consultation with the bureaus concerned. This budget breakdown, to date, has been subjected to review and hearings by the Comptroller of the Navy, the Comptroller of the Department of Defense and the Bureau of the Budget. In order to facilitate the Bureau of the Budget review, personnel from that Bureau attend the Department of Defense hearings.

In addition to the technical and fiscal reviews, hearings, and revisions enumerated above the final hearings on the Bureau of Aeronautics research and development budget for fiscal year 1956

⁹"Navy Comptroller Instruction 7110.6" of August 21, 1953 plus revisions.

will be conducted by the Congress. Prior to the Congressional hearings the technical, narrative and back-up justification will be revised as necessary to insure that the material presented to Congress will give the most accurate picture possible of the program to be followed in fiscal year 1956 and that the method of presentation conforms in all respects to the latest directives. For example, the research and development budget breakdown is currently being revised in format to comply with the latest directive from the Department of Defense. The purpose of this instruction is, "to establish uniform appropriation structure and a standard budget and expense accounting classification of obligations and expenditures for research and development appropriations throughout the Department of Defense." It provides that research and development budgets (including fiscal year 1956) will be submitted in accordance with the following breakdown:

- 1) Aircraft and Related Equipment
- 2) Guided Missiles and Related Equipment
- 3) Ships and Small Craft and Related Equipment
- 4) Combat and Support Vehicles and Related Equipment
- 5) Artillery and Other Weapons and Related Equipment
- 6) Ammunition and Related Equipment
- 7) Other Equipment
- 8) Military Sciences
- 9) Operation and Management of Facilities¹⁰

¹⁰"Department of Defense Instruction 7220.5" of January 5 1955.

CHAPTER III

PROBLEMS IN BUDGETING FOR RESEARCH AND DEVELOPMENT

As might be expected budgeting in the area of research and development encounters all the resistance and difficulties that are apt to be found in conjunction with a budget in any field of activity. In addition there are a number of problems more or less peculiar to research and development.

One of the problems is the length of time involved from the beginning of the budget formulation period to the start of the budget year. As a result of the rate of progress being achieved in research and development and the continual generation of new operational requirements, either as offensive measures or counter-measures, numerous revisions are required in the research and development program. These changes are reflected in revisions to the budget, or at least to the technical back-up material for the budget. In addition new budget directives issued during the budget formulation period often require revisions to the budget justification. All these revisions require a considerable amount of time and attention from top level personnel.

The dual nature of the hearings and reviews accorded the research and development budget and the fact that such hearings and reviews vary from level to level in detail and technical content requires an extensive preparation of justifications and

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back-up documents.

Unfortunately engineers and scientists do not take kindly to the type of detailed, dollar conscious planning which is essential to make the budget concept successful. It is necessary to educate these personnel in the idea that the budget is not a negative instrument designed to restrict their activities but rather a means of insuring that adequate funds are made available and that the most benefit is derived from these funds. There remains much work to be accomplished in convincing research and development personnel, both in the field and at the bureau level, of the value of budgets.

Prior to fiscal year 1955 the Navy's research and development program was funded from the Account, Research Navy, and eight annual appropriations.¹¹ This method of funding by annual appropriations gave rise to many problems in the research and development budget. The very nature of research and development work makes it difficult to accurately schedule the progress that will be made on a project. Unexpected failures or revisions of operational requirements may require that a project be terminated or modified. These factors, when complicated by the length of time required to negotiate contracts for this type of work, resulted in a great deal of pressure and some inefficiency in getting funds, appropriated on an annual basis, obligated for essential projects before such funds would lapse.

¹¹Office of the Comptroller, Department of the Navy
Summary Analysis Navy Dollars 1954.

Beginning with fiscal year 1955 a single no-year appropriation entitled, Research and Development, Navy was established. This has been of considerable help in alleviating the situation described in the preceeding paragraph. However, care must be exercised that the limitations inherent in an annual appropriation are not merely replaced by the administrative restrictions of apportionment, withholding of reserves, and requiring strict conformance to schedules of rates of obligation or expenditure of funds. A particular danger in this type of administrative restriction is the manner in which their effect is increased if applied by successive levels of command. Thus if apportionment, withholding reserves and schedules of obligation are specified at the Bureau of the Budget, the Department of Defense, the Navy Department and the Bureau of Aeronautics levels, each allowing an appropriate margin of safety for the regulations established by the next higher echelon, the cumulative effect on a field activity receiving such funds is most restrictive.

The area of research and development in the Navy Department is somewhat unique in the extent to which the budget is formulated on the basis of an established dollar limitation on the total of the program estimates. Since the total of the funds that would be required to effectively prosecute all the operational requirements established by the Chief of Naval Operations is normally well in excess of the dollar limitation on the total of program estimates, the problem of programing is particularly vital in the area of research and development. The Chief of Naval Operations assigns a priority to each new operational requirement he establishes and these

priorities are revised as necessary. However a new requirement usually does not cancel an existing requirement. The selection of projects to be implemented can not be made solely on the basis of priority since this could result in the complete cessation of work, and the resultant dissipation of skilled personnel, in fields which, although relatively low in priority are still essential to the Navy program.

In many instances the vital importance of a problem may well justify several concurrent attempts to solve it in a variety of different ways. These parallel approaches may all be sponsored by the Bureau of Aeronautics or they may be under the cognizance of one or more of the branches of the Department of Defense, some other government agency or a contractor. In general, however, the extremely high number of military research and development projects which are active at any one time necessitates continuous efforts at coordination to avoid unwanted duplication. This coordination constitutes one of the major problems in programing for research and development.

The inevitable emergencies which arise are a serious problem in several respects in so far as the budget and program planning are concerned. When research and development work is required to redesign a piece of equipment which has failed in fleet use or to solve an urgent operational requirement it is of course not possible to go through the usual planning and budget formulation process and schedule the work for the next fiscal year. Instead an effort is made to obtain the necessary personnel and funds with the least possible adverse effect on other programs.

Since the cost of terminating research and development projects is high it would be beneficial if research and development activities were permitted to budget a suitable amount to provide funds for such emergencies.

Another problem, perhaps not directly concerned with budgeting but one which makes research and development budgeting more difficult, is that government regulations prohibit the negotiation for a contract for research and development work with the assurance that if the development is successful and the item is to be purchased as a production item the research and development contractor will have preference in bidding on the production contract. The result has been that many companies that have fine research organizations, but are primarily concerned with production, are not interested in bidding on research and development contracts. In addition in a great many cases when the company performing the research work does not get the production contract there is an added expense in time and dollars to get into production.

Finally, a basic difficulty in budgeting for research and development is that there is no precise way of measuring the effectiveness of a program on a dollar basis until the program has been completed and the results can be evaluated against the funds expended. There is no method of making an accurate prediction as to whether a project will be successful on the first attempt, the tenth attempt or at all. This very difficulty constitutes a good reason for the necessity for constant efforts to achieve sound programing and budgeting in order to insure that the best possible

utilization will be made of the money, time, personnel, and resources available for research and development.

CHAPTER IV

CONCLUSIONS

The effectiveness of naval aviation is directly related to the progress achieved under research and development programs. Such programs should most logically be carried out during periods of peace in order that the results of research and development will be evaluated and available to the fleet in the event of war. However, since the funds available are limited in times of peace, it is particularly important that every effort be made to attain the greatest economy in their use. Thus the problem of providing the most effective research and development budget is one that merits continued investigation.

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